

Claims

1. A controlled multicast system, including an Ethernet switch and a multicast router, where the Ethernet switch connects with each host of a user in a downlink, connects with the multicast router in a uplink, the multicast router connects with a multicast router of other systems in the uplink, the Ethernet switch implementing multicast exchange of a layer 2, an IGMP V2 protocol is adopted as group management protocol between the Ethernet switch and the host of the user; wherein the controlled multicast system further comprises: a portal server and an AAA server that connect with the multicast router; the portal server acting as an interface of user access authentication, the AAA server being used for storing configuration of privilege for the user to join in a multicast group; the multicast router cooperating with the AAA server together to implement privilege authentication for the user to join in the multicast group, and distributing control commands according to results of the authentication to control multicast forwarding operations of the Ethernet switch.

2. The controlled multicast system according to claim 1, a RADIUS+ protocol extended from an AAA protocol is adopted as communication protocol between the multicast router and the AAA server; a group management protocol HGMP (Huawei Group Management Protocol) is used as a control protocol between the Ethernet switch and the multicast router.

3. A method for implementing a controlled multicast, comprises: implementing access authentication first; then an Ethernet switch classifying a vlan according to a port and handling an IGMP message from a host, implementing user identification, authentication for joining in a multicast group, and a multicast router handling the IGMP message; in succession, the multicast router controlling the Ethernet switch for multicast forwarding, between which a HGMP protocol is used as a control protocol of the controlled multicast; after that, the Ethernet switch disposing a HGMP control message and forwarding a multicast flow; the host leaving the multicast group and making corresponding processes after finishing the forwarding operation.

4. The method according to claim 3, wherein the step of implementing access authentication comprises,

(1) when accessing a network, the host inputting an authentication information that includes a User ID and a password first through an interface provided by a portal server, and a AAA server authenticating identification of the host with the information; once the authentication is successful, the multicast router recording the User ID and a corresponding vlan ID of the host in a multicast access privilege table of the user;

the step of the Ethernet switch classifying the vlan according to the port and handling the IGMP message from the host comprises,

(2) classifying the vlan according to the ports, with one vlan for each port, and linking one port to one host; searching a Content-Addressable Memory (CAM) table with a destination MAC address of the IGMP message sent by the host and forwarding the said IGMP message, of which forwarding process is same with that of a unicast message: if the port corresponding to the destination MAC address is found, forwarding the multicast message to the port, otherwise forwarding the multicast message to all the ports;

the step of implementing user identification, authentication for joining in the multicast group, and handling the IGMP message by the multicast router comprises,

(3) after receiving an IGMP Membership Report message, according to the vlan ID in the message, the multicast router finding the corresponding User ID and the host to which the IGMP Membership Report message belongs through searching in the multicast access privilege table of the user recorded in step (1), and then sending an extended RADIUS authentication message which includes the User ID just found as the user name and the address of multicast group in which the host wants to join as an attribute, to the AAA server for authentication;

the AAA server determining whether to accept the user based on services of the user; if the user has the suitable privilege, responding with an acceptance message, otherwise returning a reject message; after receiving the reject message, the multicast router do nothing, but if receiving the acceptance message, the multicast router writing the address of the multicast group in which the user can join into the multicast access privilege table of the user, and implementing a routine disposal on join messages of the host, then generating and transmitting a HGMP Join message to the Ethernet switch, which comprises the vlan ID corresponding to the port that links with the host which wants to join in the multicast group, the address of the multicast group that is applied for, and a Join command field; moreover, the multicast router also

completing a routine processing of creating multicast forwarding tree on the IGMP Membership Report message just like an ordinary multicast router does;

the step of the multicast router controlling the Ethernet switch making the multicast forwarding with the HGMP protocol being control protocol of the controlled multicast comprises,

(4) managing generation and deletion of an entry in the CAM table at the Ethernet switch by the multicast router; while allowing the host to join in the multicast group, the multicast router sending the HGMP Join message that includes the vlan ID of the host which applies to join in the multicast group and the address of the multicast group applied for to the Ethernet switch; when the multicast router wants to terminate the host joining in the multicast group, the multicast router transmitting a HGMP Leave message which comprises the vlan ID of the host which leaves the multicast group and the address of the multicast group where the host leaves;

the step of the Ethernet switch disposing the HGMP control message comprises,

(5) after receiving the HGMP Join message, the Ethernet switch searching the CAM table with the MAC address corresponding to the address of the multicast group; if the entry corresponding with the address is found, the Ethernet switch obtaining the port number of the host via searching in the CAM table with the vlan ID in the HGMP Join message, and then adding the port number into the said entry; if nothing is found, adding an entry in the CAM table, which comprises the MAC address corresponding to the multicast address, the port number of the host which applies to join in the multicast group, and the port number of the multicast router connected with the Ethernet switch;

after receiving the HGMP Leave message, the Ethernet switch obtaining the entry through looking up the CAM table with the MAC address corresponding to the multicast address of the multicast group, and getting the port number of the host through searching with the vlan ID, and then deleting the said port number from the said entry, if the said port number is the solely port of the said entry, deleting the whole entry;

the step of forwarding of the multicast flow comprises,

(6) when receiving the multicast flow sent from the multicast source, the multicast router forwarding the multicast flow to an egress based on a CAM table; when handling the IGMP Membership Report message of the host, the multicast

router creating a multicast forwarding egress according to the real port of the Ethernet switch, and sending only one copy of the multicast flow to the Ethernet switch;

the step of the host leaving the multicast group comprises,

(7) after finishing the multicast and wanting to leave the multicast group, the host sending an IGMP Leave message; after receiving the IGMP Leave message, the multicast router extracting the vlan ID from the message, and obtaining corresponding entry via searching in the multicast access privilege table created in step (1) with the vlan ID, then deleting the address of the multicast group indicated by the IGMP Leave message in the entry; after completing a routine disposal on leave messages, the multicast router generating the HGMP Leave message and sending to the Ethernet switch, which includes the vlan ID of the host which wants to leave group, the address of multicast group where the host wants to leave and a Leave command field.

5. The method according to claim 3, wherein the CAM table and the unicast forwarding table of the Ethernet switch are shared.

6. The method according to claim 3, wherein, during the messages forwarding, adopting a vlan protocol between the port of the multicast router and the Ethernet switch.

7. The method according to claim 3, in step (6) there is no vlan ID in a multicast data packet of the multicast flow sent from the multicast router.

8. The method according to claim 3, in step (7) of leaving from the multicast group can also be implemented via following means which comprises, once the multicast router knows offline status of the user, the multicast router actively sending the HGMP Leave message to terminate multicast flow transmission to the host, which is same with that of processing on the IGMP Leave message.

9. The method according to claim 3, further comprises controlling the multicast sender, which includes when the host transmits data to the multicast group, the first receiver among the multicast routers filtering the data message with a multicast Access Control List (ACL), and forwarding the data message that satisfies the requirements in the ACL to the multicast tree.

10. The method according to claim 9, wherein the multicast ACL comprises a command word, a source address and a group address.

11. The method according to claim 9, wherein the multicast ACL is distributed to each multicast router by a centralized multicast service control server; the step of controlling the sender is accomplished with the multicast ACL by the multicast router, meanwhile the multicast service control server is also acts as the AAA server.

12. The method according to claim 9, wherein the multicast ACL can also be distributed by a centralized policy server or a network manager.